What is claimed is:

1. An optical switching system comprising:

a light control portion irradiated with a signal light composed of a light pulse train;

a control light applying unit that applies a pulse-like control light synchronized with the signal light to the light control portion to selectively transmit the light pulse train within the signal light to form an output signal light;

a clock extracting unit that synchronizes the control light applied by the control light applying unit with the signal light; and

a signal detecting unit that receives the output signal light,

wherein the light control portion is composed of a thin film made of carbon nanotubes.

2. An optical switching system according to claim 1, wherein the signal light has a repetitive frequency on the order of 10^9 to 10^{12} pulses/sec.

3. An optical switching system according to claim 1, wherein a repetitive frequency of the control light is equal to or lower than 1/10 of the repetitive frequency of the signal light.

4. An optical switching system according to claim 1, wherein

any of the signal light and the control light is composed of a light pulse with a time width on the order of 10^{-12} to 10^{-15} sec.

5. An optical switching system according to claim 1, wherein the thin film contains a single wall carbon nanotube.

6. An optical switching system according to claim 1, wherein an absorption wavelength region of the thin film falls within the range of 1.2 to 1.6 μm.

7. An optical switching system according to claim 1, wherein the thin film contains a carbon nanotube a diameter of which is in the range of 0.8 to 1.3 nm.

8. An optical switching system according to claim 1, wherein the thin film is formed by spray-applying dispersion liquid in which a carbon nanotube is dispersed in a dispersion medium.

9. An optical switching system according to claim 8, wherein the dispersion medium is dimethylformamide.

10. An optical switching system according to claim 1, wherein a thickness of the thin film is in the range of 100 to 600 nm.

11. An optical switching system according to claim 1, wherein a first condensing unit that condenses the signal light to be applied to the light control portion on an irradiation surface of the light control portion is arranged in a path along which the signal light travels.

12. An optical switching system according to claim 11, wherein a diameter of a spot of the signal light condensed by the first condensing unit on the irradiation surface of the light control portion is in the range of 10 to 200 μm.

13. An optical switching system according to claim 1, wherein a second condensing unit that condenses the control light to be applied to the light control portion on an irradiation surface of the light control portion is arranged in a path along which the control light travels.

14. An optical switching system according to claim 13, wherein a diameter of a spot of the control light condensed by the second condensing unit on the irradiation surface of the light control portion is in the range of 10 to 200 μm.

15. An optical switching system according to claim 1, wherein the irradiation surface of the light control portion is divided

into plural areas, and the respective plural areas obtained through the division are optically controlled independently and in parallel.

16. An optical switching system according to claim 15, further comprising a parallelizing unit that enlarges the signal light to be applied to the light control portion so as cover the entire plural areas obtained through the division and converts the resultant light into parallel signal lights,

wherein the control light applied from the control light applying unit is applied to the light control portion so as to have such spreading within a surface perpendicular to a travelling direction as to cover the entire plural areas obtained through the division.